REMARKS/ARGUMENTS

Claims 1 to 5, 8 to 10, 12 to 15 and 17 to 20 are currently pending in this application. No new amendments have been made with this filing.

Rejection Under 112 Paragraph 1

Rejection Under 35 U.S.C. §112, Paragraph 1

The Examiner rejected the all of the pending claims as unpatentable under 35 U.S.C. §112, Paragraph 1 as failing to comply with the written description requirement. Specifically, the Examiner states that the disclosure never provides guidance on amorphous alloys that would meet all the claim limitations, and in particular that would be Ni, Be and Al free and have a glass transition temperature lower than 400 °C. Applicants respectfully traverse this rejection.

With this new rejection, the Examiner seems to acknowledge that at least U.S. Patent Nos. 5,618,359 and 5,735,975, which are incorporated by reference into the disclosure of the instant application, and which are directed to Be-free alloys, also disclose alloy families that "are broad enough to include compositions that lack nickel" and "aluminum". However, the Examiner seems to now be of the opinion that the lack of working examples of specific alloy compositions that are nickel and aluminum free render these broad teachings insufficient to meet the written description requirement. Applicants respectfully disagree with the Examiner's reading of the instant application, the prior art, and the disclosure requirements set forth in the MPEP.

First, Applicants have acknowledged in the past that the original application was directed to dental prostheses made more broadly with amorphous materials, and that thus there were included in the patent disclosure references to prior art patents and publications directed to alloys that contain one or more of Ni, Al and/or Be. However, the instant application was not completely silent as to Be, Al and Ni free alloy families that Applicants believed would have acceptable properties. For example, the

specification of the instant application begins its discussion of suitable bulk-solidifying amorphous alloys by disclosing the following material family:

> One exemplary family of bulk solidifying amorphous alloys can be described as $(Zr,Ti)_a(Ni,Cu, Fe)_b(Be,Al,Si,B)_c$, where a is in the range of from 30 to 75, b is in the range of from 5 to 60, and c in the range of from 0 to 50 in atomic percentages. Furthermore, these alloys can accommodate other transition metals, such as Nb, Cr, V, Co, in amounts up to 20% atomic and more. (Specification, Paragraph 25.)

Obviously, this formulation contemplates that each of Ni, Be and Al are "optional". In particular, Ni may be replaced with Cu or Fe and Be and Al may be replaced with Si and B, or this grouping of elements may be eliminated altogether. Later in the specification, the authors summarize the properties of the discussion of bulk-solidifying amorphous alloys by stating:

> These bulk-solidifying amorphous alloys can sustain strains up to 1.5% or more and generally around 1.8% without any permanent deformation or breakage. Further, they have high fracture toughness of 10 ksi-sqrt(in) (sqrt: square root) or more, and preferably 20 ksi sqrt(in) or more. Also, these materials have high hardness values of 4 GPa or more, and preferably 5.5 GPa or more. The yield strength of bulk solidifying alloys range from 1.6 GPa and reach up to 2 GPa and more exceeding the current state of the Titanium alloys. (Specification, Paragraphs 25 to 27.)

This description provides significant information about the properties one skilled in the art should expect from alloys made in accordance with the formulations provided. Accordingly, while the Examiner is correct that a specific alloy formulation that is Ni, Be and Al free is not provided, substantial guidance is provided as to what an acceptable Ni, Be and Al-free composition would include. Moreover, it is the Applicants' position that this disclosure is more than sufficient to satisfy the written description requirement.

In particular, Section 2163 of the MPEP makes it clear that "possession" of an invention may be shown in several different ways, stating:

> Possession may be shown in many ways. For example, possession may be shown by describing an actual reduction to practice of the claimed invention. Possession may also be shown by a clear depiction of the invention in detailed drawings or *in structural chemical formulas* which permit a person skilled in the art to clearly recognize that applicant had possession of the claimed invention. An adequate written description of the invention may be shown by any description of sufficient, relevant, identifying characteristics so long as a person skilled in the art would recognize that the inventor had possession of the claimed invention. See, e.g., *Purdue Pharma L.P. v. Faulding Inc.*, 230 F.3d 1320, 1323, 56 USPQ2d 1481, 1483 (Fed. Cir. 2000) (the written description "inquiry is a factual one and must be assessed on a case-by-case basis").

With regard to chemical patents specifically, the MPEP states:

> An applicant may show possession of an invention by disclosure of drawings or *structural chemical formulas* that are sufficiently detailed to show that applicant was in possession of the claimed invention as a whole..

Accordingly, the MPEP makes it clear that there is no requirement that a specific species of a genus need be disclosed to satisfy the written description requirement. In fact, Applicants would specifically call the Examiner's attention to the quote from the court in *Eli Lilly* contained in §2163 of the MPEP, which states, "

> In claims involving chemical materials, generic formulae usually indicate with specificity what the generic claims encompass. *One skilled in the art can distinguish such a formula from others and can identify many of the species that the claims encompass. Accordingly, such a formula is normally an adequate description of the claimed genus."* See, e.g., *Eli Lilly*, 119 F.3d at 1568, 43 USPQ2d at 1406, *italics added for emphasis*.)

In the instant case Applicants set forth a clear chemical formula that makes it clear that the alloys contemplated by the instant invention could be made without including any of Ni, Al or Be. Moreover, both the summary of the invention and the claims contained language specifically calling out embodiments of the invention that were free from these elements.

Moreover, the specification also incorporates by reference at least two additional patents that also disclose alloys in which these elements are either missing or made optional. In particular, U.S. Patent Nos. 5,618,359 and 5,735,975 not only specifically exclude Be, they also do not require either Ni or Al. Moreover, they also satisfy the *Eli Lilly* test by providing clear chemical formula that indicate the optional nature of these elements.

For example, in U.S. Patent No. 5,735,975 the formula for the genus claimed is repeatedly described by the following: $(Zr,Hf)_a(Al,Zn)_b(Ti,Nb)_c(Cu_xFe_y(Ni,Co)_z)_d$. Note that Be is not included in the basic formulation and Ni and Al are clearly optional. The optional nature of these materials is repeated throughout the patent, where, on almost every occasion, Al is discussed as interchangeable with Zn and Ni is discussed as interchangeable with Co. As an example, in describing the scope of the alloys disclosed therein, the authors of U.S. Patent No. 5,735,975 write:

> At least quinary alloys form metallic glass upon cooling below the glass transition temperature at a rate less than 10^3 K/s. Such alloys comprise zirconium and/or hafnium in the range of 45 to 65 atomic percent, titanium and/or niobium in the range of 4 to 7.5 atomic percent, and *aluminum and/or zinc* in the range of 5 to 15 atomic percent. The balance of the alloy compositions comprise copper, iron, and *cobalt and/or nickel*. ('975 Patent, Abstract, *italics added for emphasis*.)

Later in the disclosure the optional nature of these compositions is made even more explicit where the authors write:

> It has been discovered that quinary or more complex alloys with titanium, zirconium (or hafnium), aluminum (or zinc), copper and nickel (or cobalt) form metallic glasses with much lower critical cooling rates than previously thought possible. ('975 Patent, col. 3, lines 1 to 5.)

In the very next paragraph the authors continue this consistent statement of the alloy composition stating:

> Quinary alloys have titanium and/or niobium, aluminum and or zinc, zirconium and/or hafnium, copper and nickel and/or cobalt, and optionally, some iron. ('975 Patent, col. 3, lines 17 to 19.)

The paragraph after that even addresses—explicitly—the "interchangeable" nature of Al and Ni, stating:

> Likewise, titanium is interchangeable with niobium and aluminum is interchangeable with zinc. Cobalt can be substituted for nickel and within limits iron can be included. ('975 Patent, col. 3, lines 33 to 35.)

Applicants could give additional examples, but believe the above should be sufficient to provide evidence that one of ordinary skill in the art, having read the '975 patent, would have understood that Al could be exchanged with Zn and Ni with Co, without impacting the properties of the alloys in question. Accordingly, while it is true that NO specific example of an Al and Ni free alloy is provided in the '975 patent, Applicants would submit that one of ordinary skill in the art would have read those exemplary embodiments as also providing compositions in which the Al and Ni could be exchanged for Zn and Co, respectively, again, without effecting the alloy properties.

Moreover, Applicants believe that the question of whether specific species are provided does not need to be reached. From a written description perspective, as explained in the *Eli Lilly* case, there can be no doubt that there is more than sufficient (and repeated) disclosure of chemical formulae and supporting description provided in the '975 patent such that one skilled in the art would have been drawn to the inescapable conclusion that the authors of the '975 patent "had possession" of bulk-solidifying amorphous alloys, having the properties required by the claims of the instant application, that could be made free of Be, Al and Ni.

A similar analysis can be made of U.S. Patent No. 5,618,359; however, unlike the '975 patent, the alloys disclosed in the '359 patent explicitly exclude both Be and Al. The only question in the '359 patent is whether Ni can be excluded from the disclosed bulk-solidifying amorphous alloys. Applicants will establish that, as in the '975 patent, Ni is

repeatedly recited in the alternative in the '359 patent and may be explicitly replaced with Co. For example, in stating the broadest formulation of their amorphous alloy the authors of the '359 patent write:

> This can be stated by the formula:
>
> $Ti_a(ETM)_b(Cu_{1-x}(LTM)_x)_c$
>
> where ETM is selected from the group consisting of Zr and Hf, LTM is selected from the group consisting of Ni and Co, x is atomic fraction, and a, b, and c are atomic percentages, wherein a is in the range of from 19 to 41, b is in the range of from 4 to 21, and c is in the range of from 49 to 64. There are the additional constraints that $2<x\cdot c<14$ and $b<10+(11/17)\cdot(41-a)$. Other constraints are that when $49<c<50$, then $x<8$ when $50<c<52$, then $x<9$ when $52<c<54$, then $x<10$ when $54<c<56$, then $x<12$ and when $c>56$, then $x<14$. ('359 Patent, col. 2, lines 54-66.)

Indeed, later in the patent, the authors make the interchangeability of Ni and Co explicit and absolute, stating:

> In other words, nickel and cobalt are completely interchangeable up to 18 percent. ('359 Patent, col. 6, lines 39 and 40.)

Given the absolute nature of this statement, Applicants would argue that every one of the exemplary alloys disclosed in Table I of the '359 patent, and fully half of those in Table II, could just as easily contain only Co. Moreover, again Applicants would submit that, under the MPEP, this is not the proper inquiry. The proper inquiry is whether one skilled in the art would recognize that the Applicants "had possession" of bulk-solidifying amorphous alloys that met the properties required by the instant claims and were also Ni, Be and Al free. Given the explicit and absolute statement of the interchangeability of Ni and Co by the authors of the '359 patent Applicants cannot see how any other conclusion can be reached.

Accordingly, both the instant disclosure and two of the four patent references cited by Applicants in the disclosure as setting forth materials applicable for use in the

claimed invention, recite amorphous alloys having the requisite cooling characteristics and, are, or can be made free of Be, Al and Ni.

Conclusion

In view of the foregoing amendment and response, it is believed that the application is in condition for further examination. If any questions remain regarding the allowability of the application, Applicant would appreciate if the Examiner would advise the undersigned by telephone.

Respectfully submitted,

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